

Teaching Reform Measures of Fitter Practice in Engineering Universities

Shumei Zhu^a, Wei Liu^{b*}, Kun Ren^c and Zhenwu Ma^d

Suzhou University of Science and Technology, Suzhou, China

^azhushumei_sust@qq.com, ^bliuwei_sust@qq.com, ^c821439448@qq.com, ^dmazw@usts.edu.cn

*Corresponding author

Keywords: Fitter practice; Teaching reform; Engineering universities

Abstract. With rapid development of mechanical manufacturing, the fitter as a traditional process is gradually marginalized and the tendency still continue. In order to let fitter better meet industry requirements, teaching reform of fitter training is imperative. However, unitary teaching content, monotonous training methods and old teaching patterns generally exist in current fitter practice. This paper presents implementing interest teaching, project teaching and interaction teaching in fitter practice. The teaching reform measures bring significant improvement on quality of teaching.

1. Introduction

Fitter practice course is an introductory basic training course that engineering universities train talents with comprehensive engineering training abilities. As a basic part of metalworking practice, fitter practice can make students master many basic skills (such as lineation, carving, sawing, filing, drilling and tapping) [1], understand the basic process and master operation procedures of used equipment. It also plays a positive role in establishing right concept of labor, developing innovation thinking and training students' ability to link theory with practice and solve specific problems independently. By simulating actual working environment and using real cases as students' practice product, fitter practice combines practice with theory and emphasizes students' participation. There are many characteristics different from course teaching, which can enhance students' professional skill, practical experience, working methods and teamwork in a short time. The purpose of practice is to comprehensively improve students' professional level and let students and employers get mutual satisfaction.

2. Present condition analysis of fitter practice

With in-depth extension of engineering integration reform [2], the class hour of fitter practice is reduced by half. Current fitter practice generally has fixed teaching pattern, which is training internships with skilled master. And the teaching content is unitary duck bill hammer in most universities. Though there is a certain professional degree in manufacturing duck bill hammer, it constraints students' innovation consciousness and is rigid and hard to master [3]. There are two major challenges in fitter practice as following:

(1) The class hour of fitter practice is reduced, but the teaching content and requirement remain the same. As a part of metalworking practice, fitter practice is mainly for first-year students majoring in engineer. Because the students always study theoretical knowledge and lack practical experience before fitter practice, they may be not interesting in fitter practice. Besides that, students do not attach importance to practical teaching on thought and lack right concept of labor. They simply think fitter is filing iron and making hammer. Meanwhile, compared with other types of work, stronger labor intensity [4] and harsher environment in fitter practice make students much easier to be perfunctory [5]. All these factors may cause security accidents and personal injury.

(2) Fitter practice is an integrated course combining theoretical knowledge and operating skills, which requires teachers have both professional theoretical knowledge and experienced operation skills. Obviously, most teachers do not meet the requirement [6]. Older teachers master operation but lack systematic theoretical knowledge. Young teachers have systematic theoretical knowledge but

lack operation experience. Practice teachers have uneven comprehensive professional quality. Generally speaking, most of teachers need enhance work experience of enterprises and improve the comprehensive professional quality. In practice teaching, the methods and contents teachers use are often boring and dull. students can hardly implement practice with interest, which hampers the improvement of teaching quality.

In a word, unitary teaching content, monotonous training methods and old teaching patterns in fitter practice make students hard to get interested and study hard, which have seriously affected the quality of fitter practice. To change the present situation and improve teaching quality, based on authors' years of teaching experience and achievements of teaching reform, this paper presents teaching reform measures around the following aspects: (1) how to arouse students' interest; (2) how to train students' innovation consciousness on the basis of keeping practice professional; (3) how to enhance teachers' comprehensive teaching abilities. The detailed content of reform measures is as following.

3. Reform measures of fitter practice

In order to solve the above problems, three measures are presented:

(1) Arousing students' interest before practice

Students' curiosity can be used to arouse study interest. In mobilization meeting, teachers can play related videos and multimedia courseware for students. Former students show excellent works, explain basic process and share study experiences for new students. Mobilization meeting can show students the features of practice, labour intensity and practice environment. Students can get a basic understanding before practice. Excellent work show and communication with former students can arouse students' curiosity and showmanship, and stimulate students' interest and enthusiasm.

(2) Using project teaching method

In project teaching method, a separate project is carried out by students almost completely, including information collection, plan design, project implementation and score evaluation. The advantage of project teaching method is that students can understand whole process and master every step [7]. Project teaching method takes the project as the main line, teachers as the guide, and students as the main body. The method claims that students practice and study firstly, and then teachers explain. The difference from other methods emphasizes students' independent study and active participation. Starting with attempts and exercise can arouse students' initiative, creativity and enthusiasm. Let the students play "leading roles" and teachers become "supporting role", which realizes the transposition of the roles of teachers and students and is beneficial to cultivate students' self-learning ability and innovation ability.

In fitter practice, project teaching method can be used to avoid that all students make duck bill hammers. Students decide to make products which they want by themselves. Different products need profiles and plates with different shapes and dimensions. Teachers need to prepare them based on the number of products. The size of workblanks should be appropriate. Too big size brings too much workload and students can hardly finish in time. On the contrary, too small size means insufficient workload, which cannot meet teaching requirement. Diversified project teaching can make fitter practice more interesting and attractive, and students can improve their skills with interests and enthusiasm in practice.

(3) Attaching importance to interaction in practice

Interaction is very important for fitter practice. For example, students show the sketches of their design work in first class and explain the technological process based on knowledge and experience from mobilization meeting and former students. Then teachers evaluate and change the process. At last, some conventional and representative examples are selected to explain in detail. The interaction can test teaching results and make the practice more interesting. Students can be selected to demonstrate operational motion of fitter skills firstly. And then teachers direct and correct. For key operating points, teachers not only show right operation and skills for students but also explain scientific basis. Generally, most of students have some practical experience and they can relate to what teachers show and explain. When explaining bench screw, not only the structure and key

operating points but also reticular cross grain is explained. Students can think of the effect naturally which is increasing friction to clamp tightly. The common sense shows students that fitter practice is based on scientific evidence, which is helpful for students to build confidence and establish right labor intensity.

(4) Evaluating grades based on comprehensive abilities and various qualities

The main purpose of practice is training and improving students' practical ability and innovation consciousness. The practice course can also help students establish right labor intensity and cultivate talents for scientific researches. So, the grades should be evaluated based on product innovation degree, difficult degree, final quality, students' attendance, interaction and practical reports, which can reflect students' comprehensive abilities and various qualities [8]. Students should specially pay attention to the reports. The content should contain basic theoretical knowledge and personal experience in practice. Students can overview and think the whole practice by writing practical reports.

(5) Improving teachers' comprehensive abilities [9]

Some measures should be taken to encourage and strength teachers' training. For older teachers, systematic theoretical knowledge is more important. And for young teachers, operation skills are more imperative. The latest developments and important exchange in the field should also be introduced and attended. Teachers should enhance multimedia skill training and master multimedia and PPT to explain teaching content, which helps students understand knowledge better. Besides, teachers should be encouraged to direct students and attend national engineering training comprehensive ability competition and mechanical innovation design competition for college students. Both teachers and students can improve research and innovation ability.

4. Summary

Through the above analysis, fitter practice is an important way of studying traditional manufacturing technology. Through the study of fitter practice, students can improve comprehensive abilities including practical ability, communication ability and innovation ability. Teaching reform measures of fitter practice in this paper can change traditional teaching concept and enhance interest and interactivity of fitter practice. Advanced teaching methods are used to help students' study better. The results of the performance prove that students' study enthusiasm is aroused and comprehensive abilities are obviously enhanced.

Acknowledgement

This research was financially supported by the Curriculum Teaching Comprehensive Reform Project of Suzhou University of Science and Technology (NO.2018KJZH-55).

References

- [1] B. Xu, Exploration and practice of improving the teaching quality of fitter training course in higher vocational colleges, *Silicon Valley*, No. 20, pp. 147, 2010. (In Chinese)
- [2] Z. F. Zhao, Three problems must be considered in the reform of fitter training, *Technology Wind*, No. 12, pp. 231, 2012. (In Chinese)
- [3] B. Y. Zhou, Reform and practice of extending teaching of fitter skill course, *Guangxi Journal of Light Industry*, No. 30, pp. 209-210, 2014. (In Chinese)
- [4] D. X. Han, Analysis of application methods of improving teaching quality in fitter practice, *Technology and Market*, No.10, pp. 217, 2014. (In Chinese)
- [5] Y. M. Shang, Discussion on effective strategies to improve the teaching quality of fitter practice, *South Agricultural Machinery*, No. 15, pp.145, 2018. (In Chinese)

- [6] X. Li, Exploration on effective strategies to improve the teaching quality of fitter practice, *Reading and Writing (educational journal)*, No. 5, pp. 35, 2016. (In Chinese)
- [7] L. He, How to improve the teaching quality of fitter training course, *Occupation*, No. 12, pp. 55, 2011. (In Chinese)
- [8] S. R. Yang, Practice and experience of improving the teaching quality of fitter practice, *Science & Technology Information*, No. 34, pp. 589, 2007. (In Chinese)
- [9] X. Wang, Discussion on effective approach to improve the teaching quality of fitter practice in secondary vocational schools, *Chi Zi*, No. 8, pp. 267, 2015. (In Chinese)